



EME na mikrovlnách s novými technologiemi

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<http://www.urel.feec.vutbr.cz/esl/files/EME/EME.htm>

Gajów, June 11- 14, 2015

Přehled

1. Současný stav
2. Nové technologie
3. WSJT s módy pro mikrovlny
4. Dopplerův posuv a přesnost frekvence
5. Plánování spojení a provoz

SSB, CW nebo JT ???

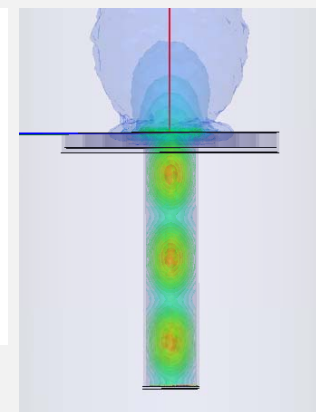
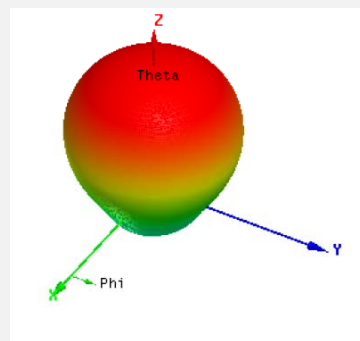
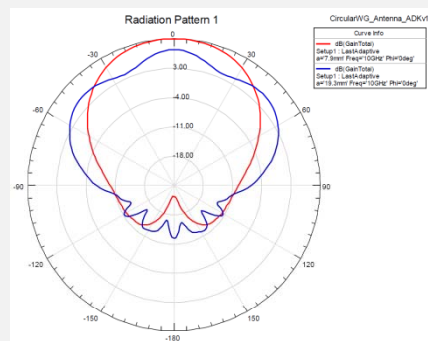
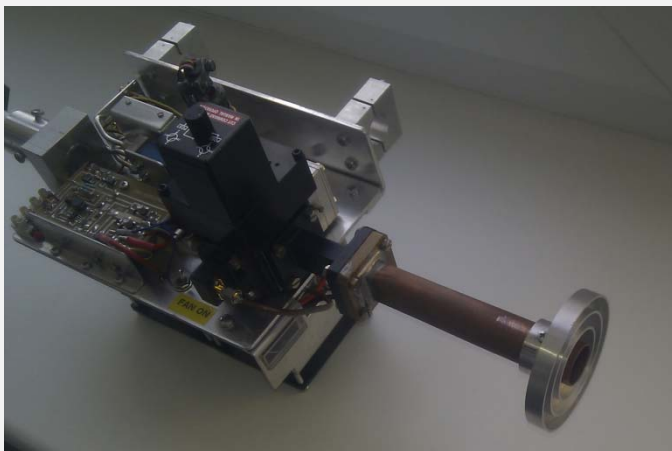
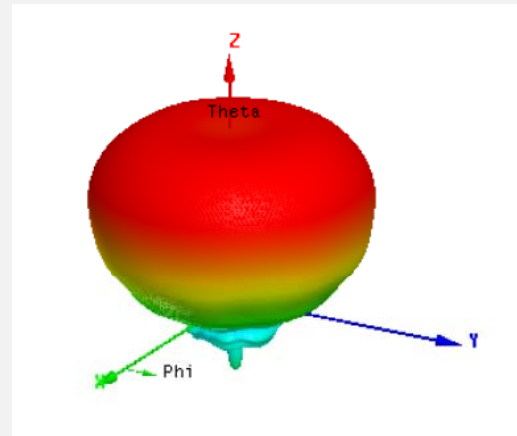
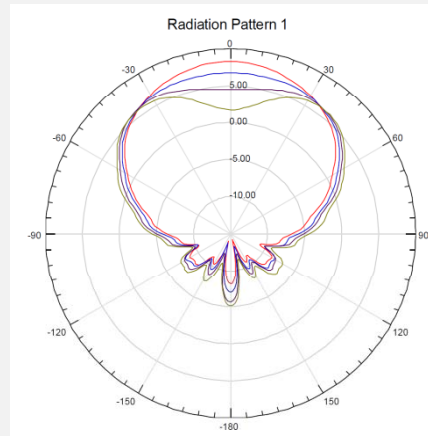
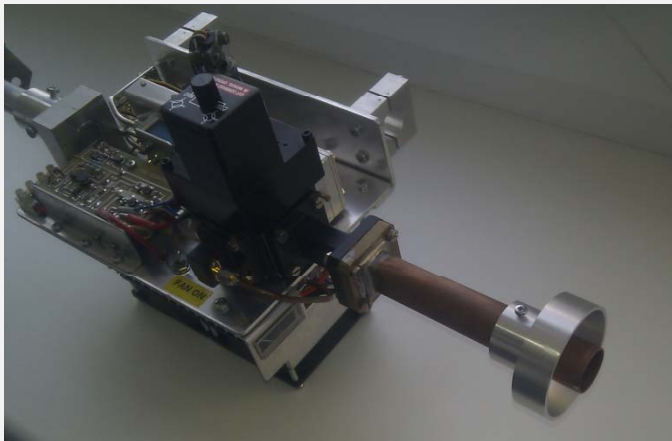
OK1KIR: “Z 27 stanic na 10 GHz již 15 stanic umí pracovat provozem JT4. Navzdory různým názorům platí, že kde končí CW tam JT4 bez problémů pokračuje.....“

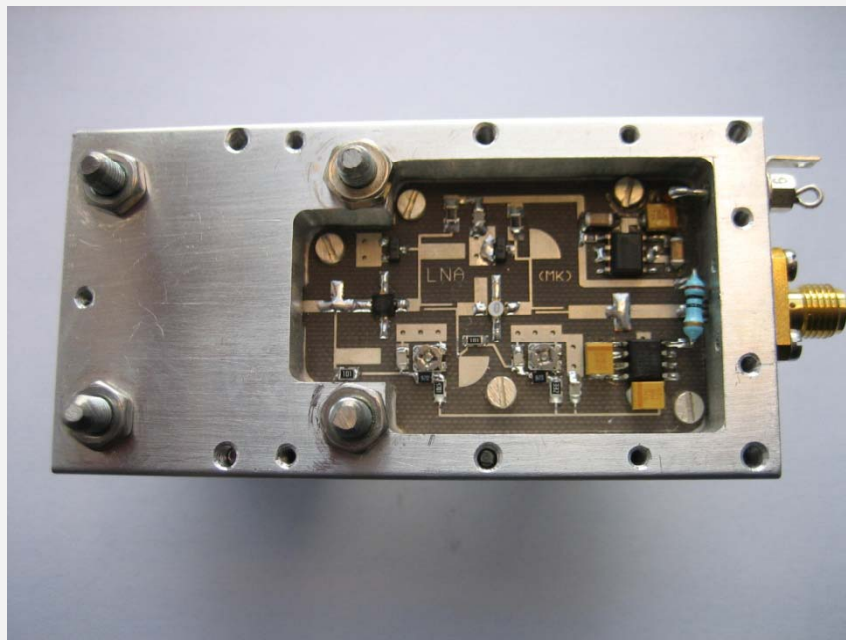
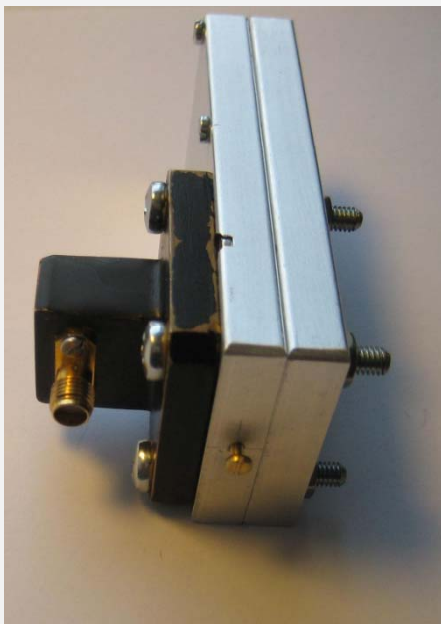
G3WDG:

- ✓ If signals are strong, try SSB
- ✓ If signals are audible, try CW
- ✓ If signals are inaudible, try Digital

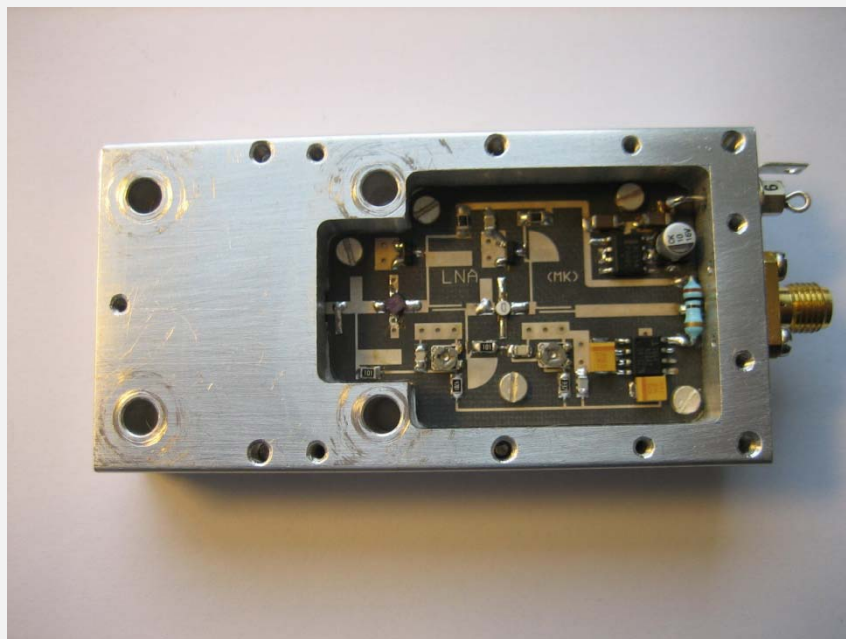
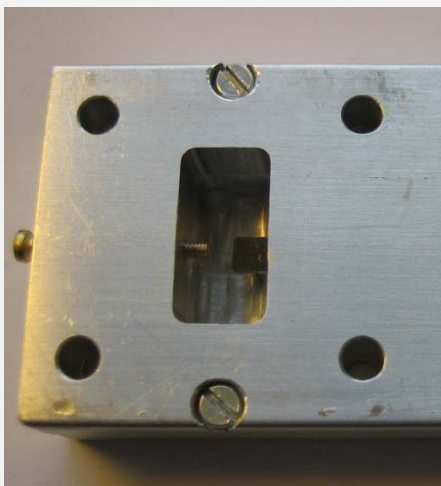
ANTÉNA

Polarizace, kompenzace „spatial“ offsetu (30° -1,25 dB)
přesný „tracking“
fázový střed ozařovače



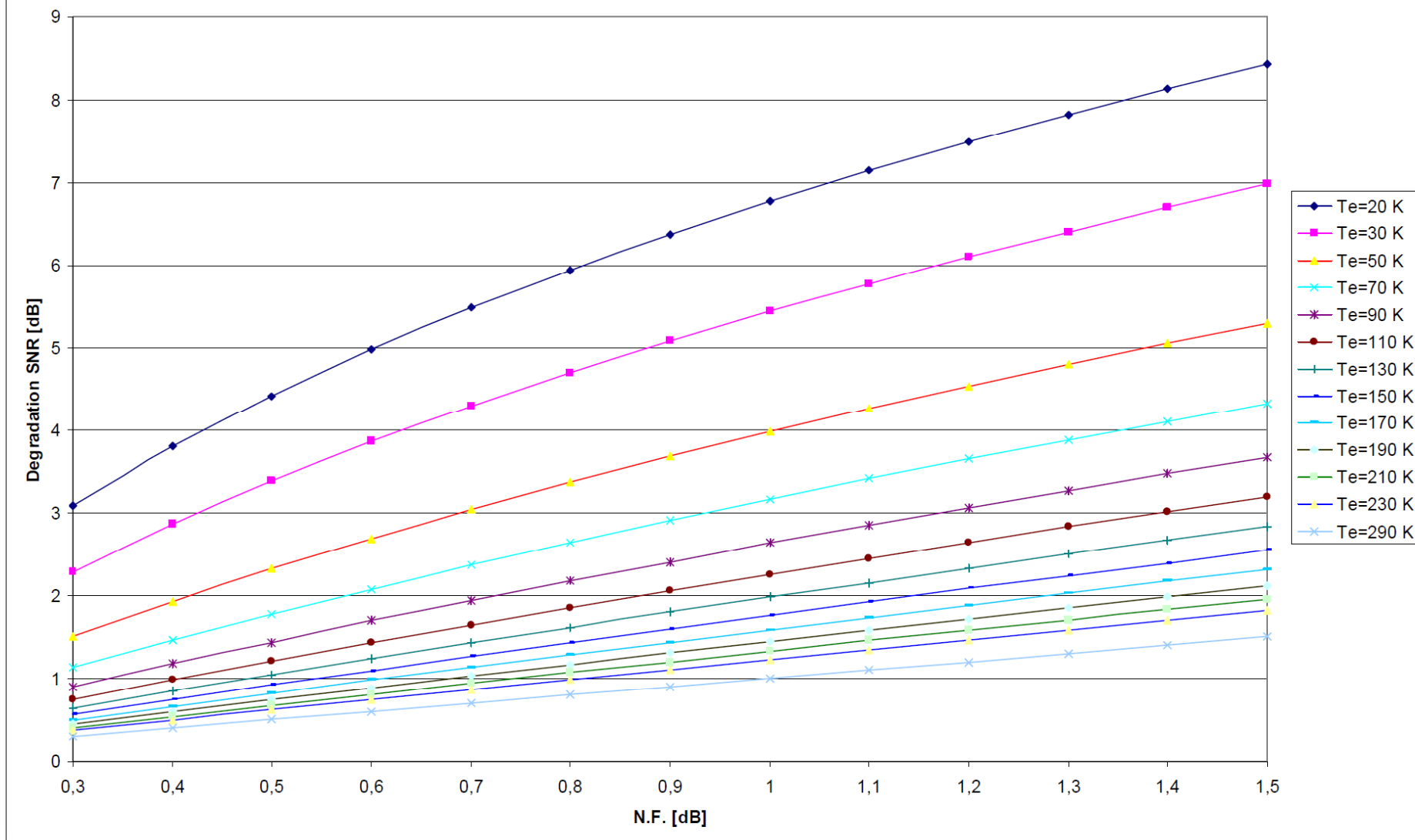


NE3511S02
DiCLAD 870

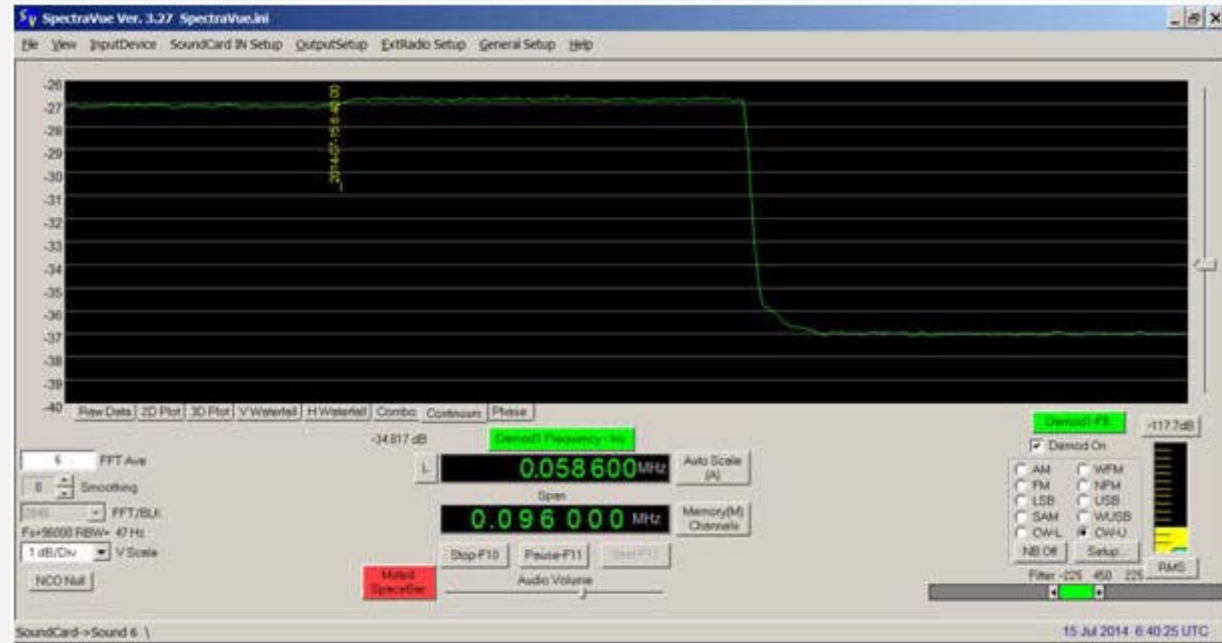


MGF4953A
Duroid 5880

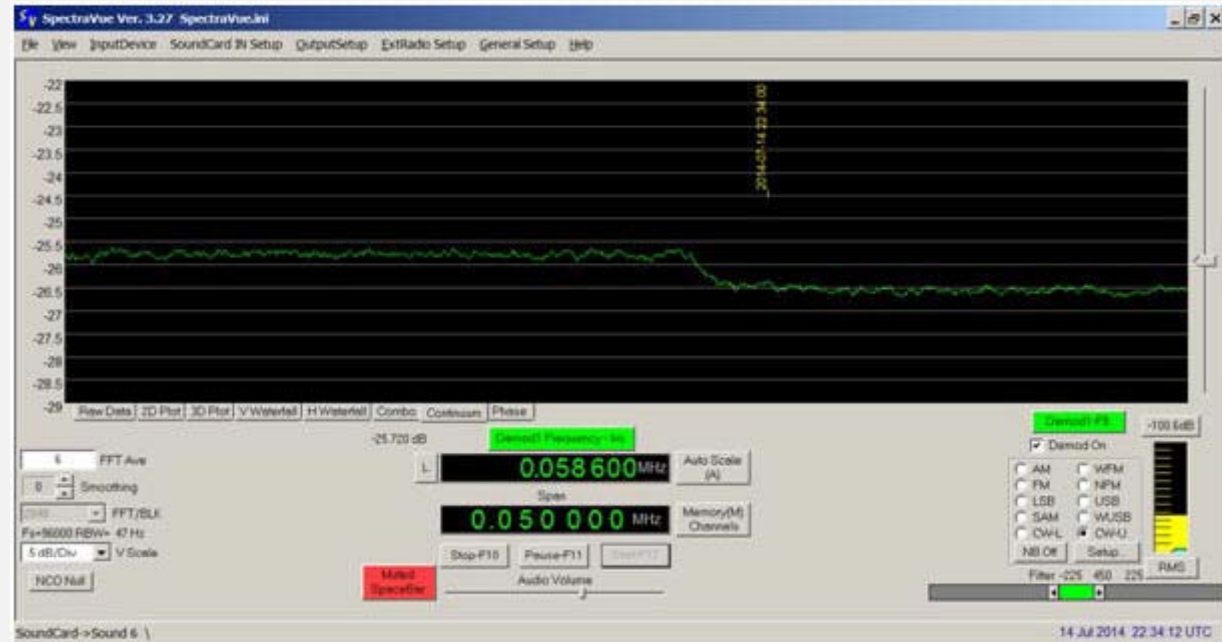
SNR degradation by receiver



SN/CS

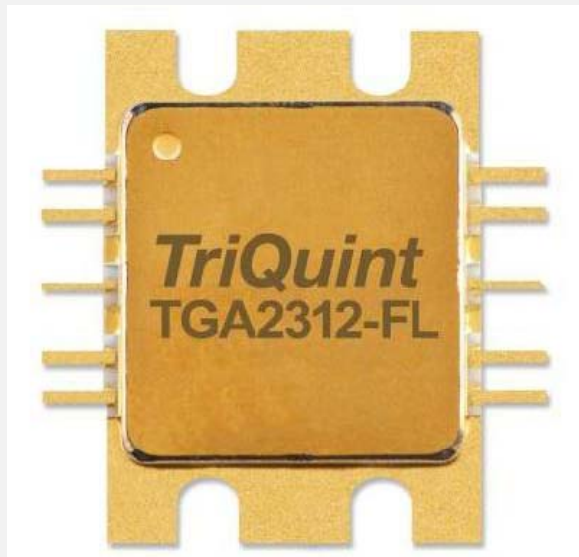


MN/CS





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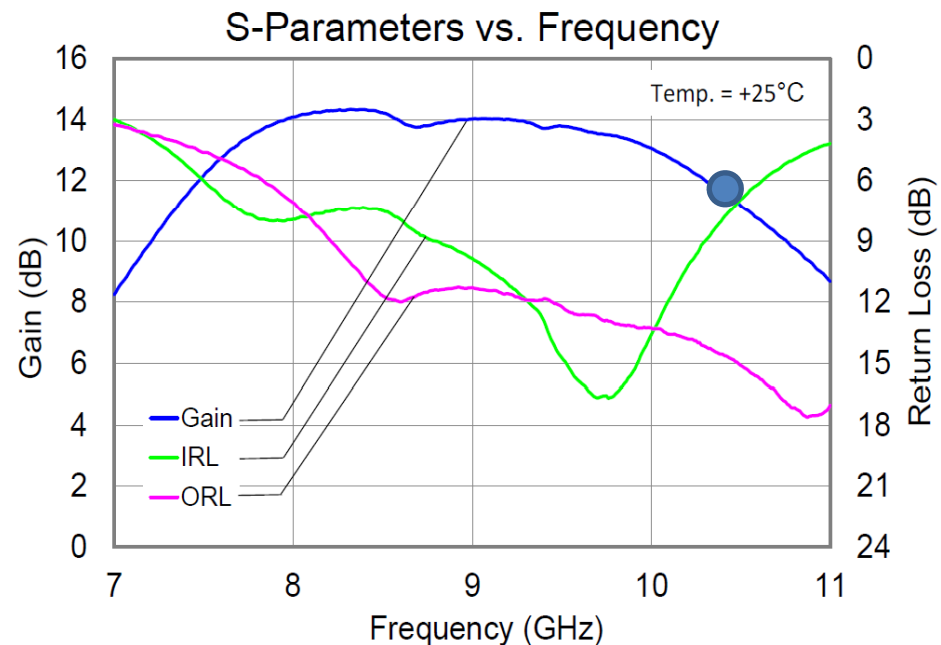
- Frequency Range: 9 – 10 GHz
- P_{SAT} : 48 dBm (60 W)
- PAE: 38%
- Small Signal Gain: 13 dB
- Bias: $V_D = 24$ V, $I_{DQ} = 2.4$ A, $V_G = -2.6$ V Typical
- Pulsed: PW = 100us, DC = 10%
- Integrated Thermistor Temperature Monitor
- Package Dimensions: 17.4 x 24.0 x 3.9 mm

GaN

$V_D = 24$ V; $I_{DQ} = 2,4$ A

PAE 38%

1134 Euro



WSJT pro mikrovlny

Astronomical data

	Az	E1
Moon:	3.76	-44.72
Moon/DX:	1.21	-44.12
Sun:	321.40	-22.59
Source:	344.34	-39.08
	DX	Self
Dop:	2445	2760
df/dt:	81.37	81.91
Spread:	291.3	292.5
w50:	108.2	108.6
	RA	DEC
Moon:	23:00	-4.64
Source:	00:00	0.00
Freq:	10368	Tsky: 3
MNR:	0.0	Dgrd: -0.4
DPol:	-1	SD: 16.59
LST (h):	11.194	

WSJT 10.0 r5046 by K1JT

File Setup View Mode Decode Save Band Help

Moon
Az: 3.61
E1: -44.73
Dop: 2407
Dgrd: -0.4

6.9 1.0000 1.0000 Time (s) OK1CA_140919_121300.WAV

FileID	Sync	dB	DT	DF	W				
120500	0	-21	-1.0	46	4	*			
120700	6	-15	2.2	-22	48	*	OK2AQ	OK1CA	JO70
120900	5	-15	3.0	-31	55	*	OK2AQ	OK1CA	
121100	4	-16	3.7	-26	50	#	OK2AQ	OK1CA	R-15
121300	6	-15	5.0	-28	48	#			
121300	6	-15	5.0	-28	48	#	OK2AQ	OK1CA	R-15

121300 2 12/12 OK2AQ OK1CA R-15 ? 0 3

Log QSO Stop Monitor Decode Erase Clear Avg Include Exclude Tx Stop

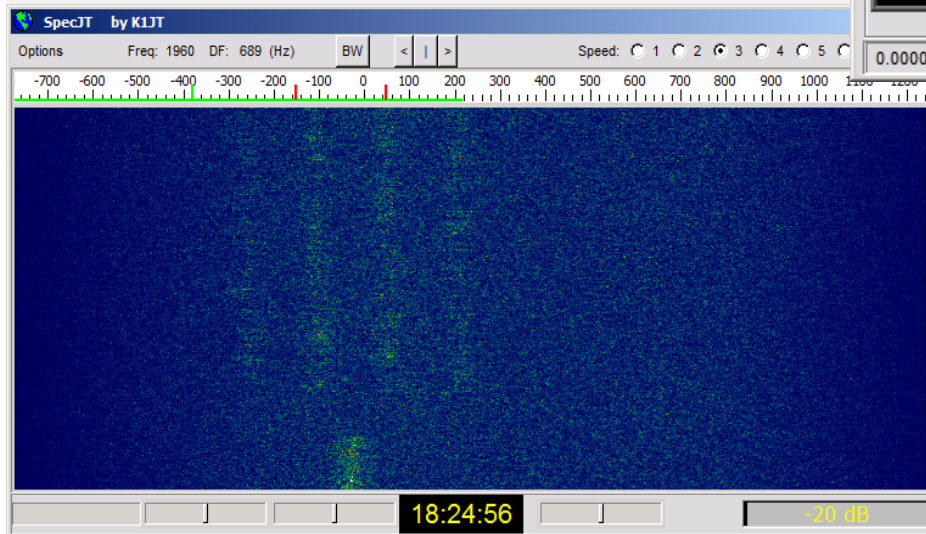
To radio: OK1CA Lookup
Grid: JO70gm Add
Az: 300 94 mi

2015 Apr 15 20:30:55 Dsec 0.0

Sync 0 Zap
Tol 100 AFC
MinW D Efreeze
Tx First
Rpt: -15
Gen Msgs Auto is Off

OK1CA OK2AQ JN89 Tx1
OK1CA OK2AQ -15 Tx2
OK1CA OK2AQ R-15 Tx3
@1500 (RRR) Tx4
@1700 (73) Tx5
@1270 (TUNE) Tx6

0.0000 0.0000 JT4F Freeze DF:-381 Rx noise: -2 dB T/R Period: 60 s Receiving



JT4

Letter	Width (Hz)
A	4.4
B	8.8
C	17.5
D	39.4
E	78.8
F	157.5
G	315

Střed
spektra
je
1270 Hz

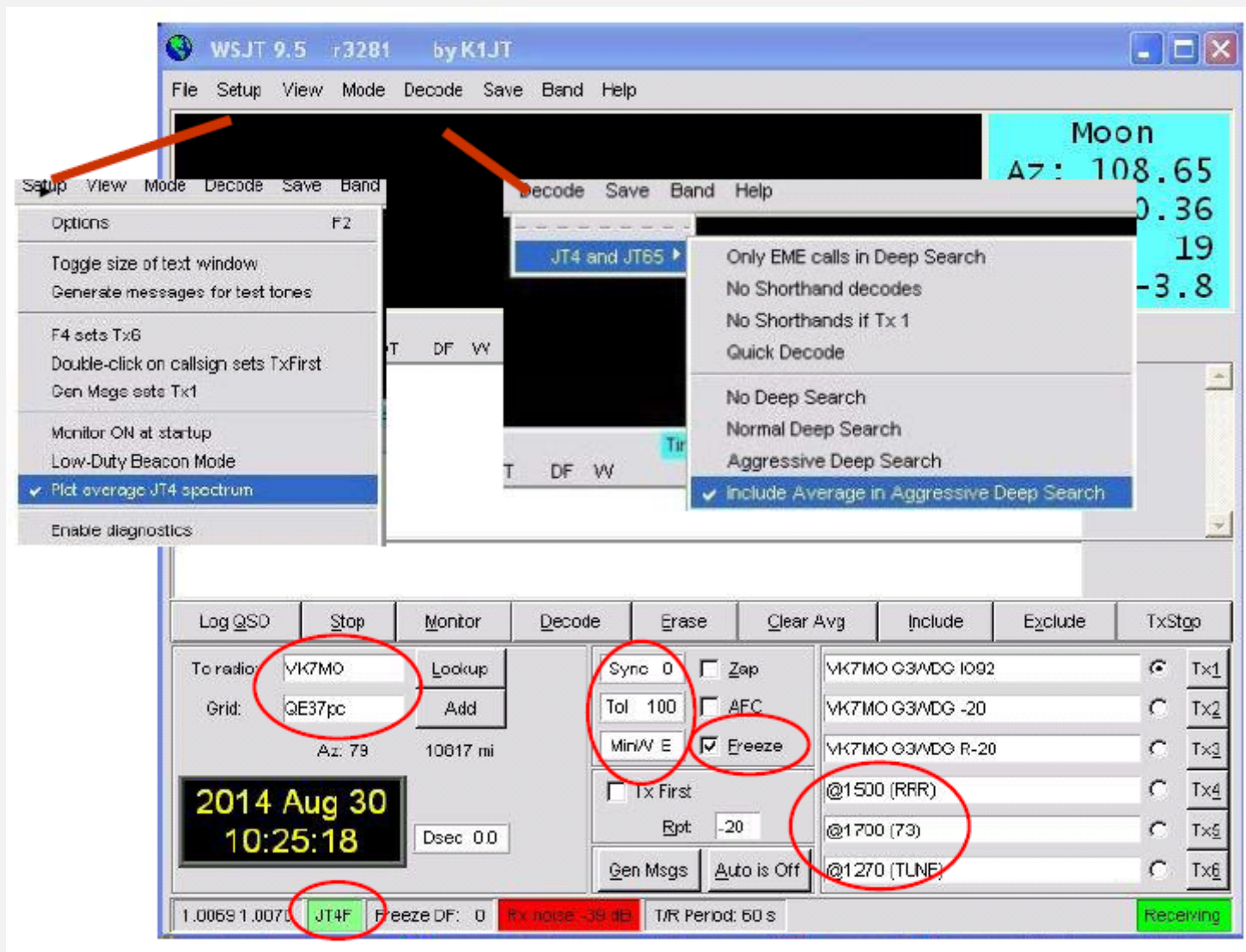
JT4 operating on EME

v9

by the JT4F 10/24GHz EME Group

VK7MO, OK1KIR, G3WDG, W5LUA, OK2AQ.....

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- zpráva může obsahovat 13 znaků
- averaging další 2-3 dB citlivosti
- JT4F nejlepší kompromis na 10 GHz
- jednotónové zprávy
RRR-1500 Hz
73-1700 Hz
QRT-2000 Hz

The screenshot shows the WSJT 10.0 software interface. At the top, there's a menu bar (File, Setup, View, Mode, Decode, Save, Band, Help) and a status bar (0.0000 0.0000 JT4F Freeze DF:-381 Rx noise: -2 dB T/R Period: 60 s Receiving). The main window is divided into several sections:

- Waterfall Plot:** Shows frequency and amplitude. A red box highlights the time '7.7' and '1.0000 1.0000'.
- Moon Data:** Az: 4.43, El: -44.70, Dop: 2608, Dgrd: -0.4.
- Table:** A table with columns FileID, Sync, dB, DT, DF, W, and decoded text. A blue circle highlights the 'W' column, and a red box highlights the decoded text columns. The table shows several entries for OK2AQ and OK1CA.
- Log QSO:** A table with columns Log QSO, Stop, Monitor, Decode, Erase, Clear Avg, Include, Exclude, Tx Stop.
- To radio:** OK1CA, Grid: JO70gm, Az: 300, 94 mi.
- Sync:** 0, Zap, AFC, Efreeze, Tx First, Rpt: -15, Gen Msgs, Auto is Off.
- Decode List:** OK1CA OK2AQ JN89, OK1CA OK2AQ -15, OK1CA OK2AQ R-15, @1500 (RRR), @1700 (73), @1270 (TUNE).

-19 < dB < -10

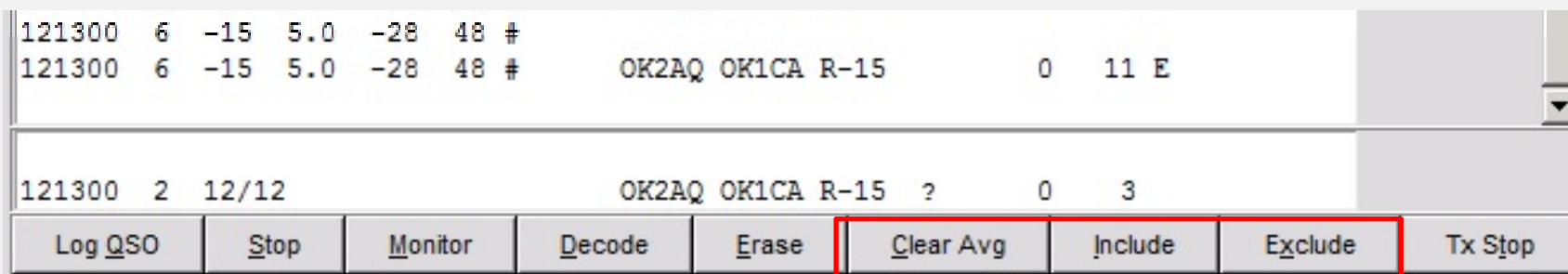
Sync * volačky + lokátor
reporty
* nekódovaný text

1 – konvoluční dekodér

0 – korelační dekodér, počet konfidencí
E – šířka dekodéru

Averaging - průměrování

- vysílaná zpráva se beze změn opakuje
- příjemce musí rozhodnout zda právě proběhlou rx periodu zahrne do průměrování či ne (ano když DT, DF a sync stejné)



Post-processing

- WSJT umožňuje uložit rx periody do složky RxWav a znovu je dekódovat (nastavit „Save“)
- Do Tx6 zadat „ $\$-2$ “ a S/N bude snížen o 2 dB. Toto umožňuje odhadnout rezervu pro dekódování

New software WSJT-X

1,2 dB better sensitivity for single period decoding

Doppler compensation by CAT

WSJT-X v1.6.0-devel by K1JT

File View Mode Decode Save Help

Single-Period Decodes

UTC	dB	DT	Freq	Message
0414	-19	2.06	995	*
0416	-18	2.40	991	*
0420	-16	2.40	989	* OK1KIR VK7MO QF22 7 D
0422	-18	2.40	978	*
0424	-16	2.40	982	* OK1KIR VK7MO QF22 15 D
0430	-18	2.40	989	*
0438	-20	2.86	980	*
0440	-18	2.40	987	*
0442	-17	2.40	987	* OK1KIR VK7MO QF22 2 D
0448	-19	2.43	995	* OK1KIR VK7MO QF22 1 D
0450	-19	2.40	987	*
0458	-19	2.17	1046	*
0503	-16	1.94	899	#
0505	-16	1.94	925	*
0507	-16	1.71	925	#

Average Decodes

UTC	dB	DT	Freq	Message
0416	-18	2.34	991	* OK1KIR VK7MO QF22 12 C 19
0420	-16	2.34	989	* OK1KIR VK7MO QF22 15 C 20
0422	-18	2.34	978	* OK1KIR VK7MO QF22 15 C 21
0424	-16	2.34	982	* OK1KIR VK7MO QF22 14 C 22
0430	-18	2.34	989	* OK1KIR VK7MO QF22 13 C 23
0440	-18	2.34	987	* OK1KIR VK7MO QF22 13 C 24
0442	-17	2.34	987	* OK1KIR VK7MO QF22 13 C 25
0448	-19	2.34	995	* OK1KIR VK7MO QF22 13 C 26
0450	-19	2.34	987	* OK1KIR VK7MO QF22 14 C 27

Log QSO Stop Monitor Erase Clear Avg Decode Enable Tx Halt Tx Tune

3cm 10 368 100 000 Pwr

Settings

General Radio Audio Tx Macros Reporting Frequencies Colors

Station Details

My Call: OK1KIR My Grid: JN79dw

Message generation for type 2 compound callsign holders: Full call in Tx3

Display

Blank line between decoding periods

Display distance in miles

Tx messages to Rx frequency window

Show DXCC entity and worked before status

Behavior

Monitor off at startup

Double-click on call sets Tx enable

Disable Tx after sending 73

Runaway Tx watchdog

CW ID after 73

Monitor returns to last used frequency

Allow Tx frequency changes while transmitting

Enable VHF/UHF/Microwave features

Decode at t = 52 s

Periodic CW ID Interval: 0

OK Cancel

WSJT-X - Wide Graph

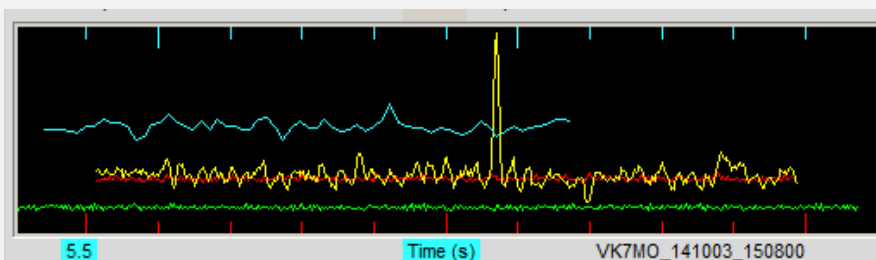
Bins/Pixel 3 Start 0 Hz Palette Adjust... Flatten Smoothing

JT65 2500 JT9 N Avg 2 Green2 Linear Avg 5

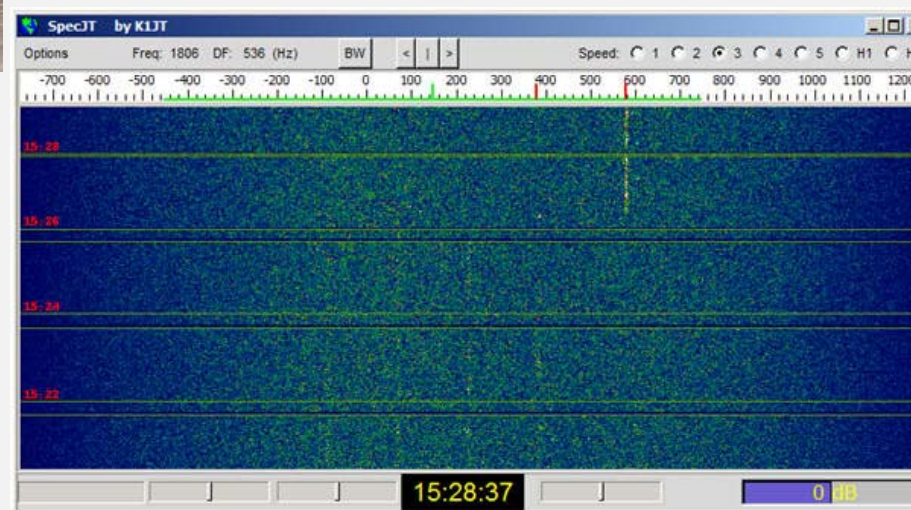
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VK7MO – 77 cm dish, 50 W



OK2AQ – 1,8 m dish, 20 W



FREKVENCE

Malý systém je nutné pověsit na **atomový oscilátor** GPS (Cesium) a nebo Rubidium tak, aby neurčitost kmitočtu byla nejvýše desítky Hz.

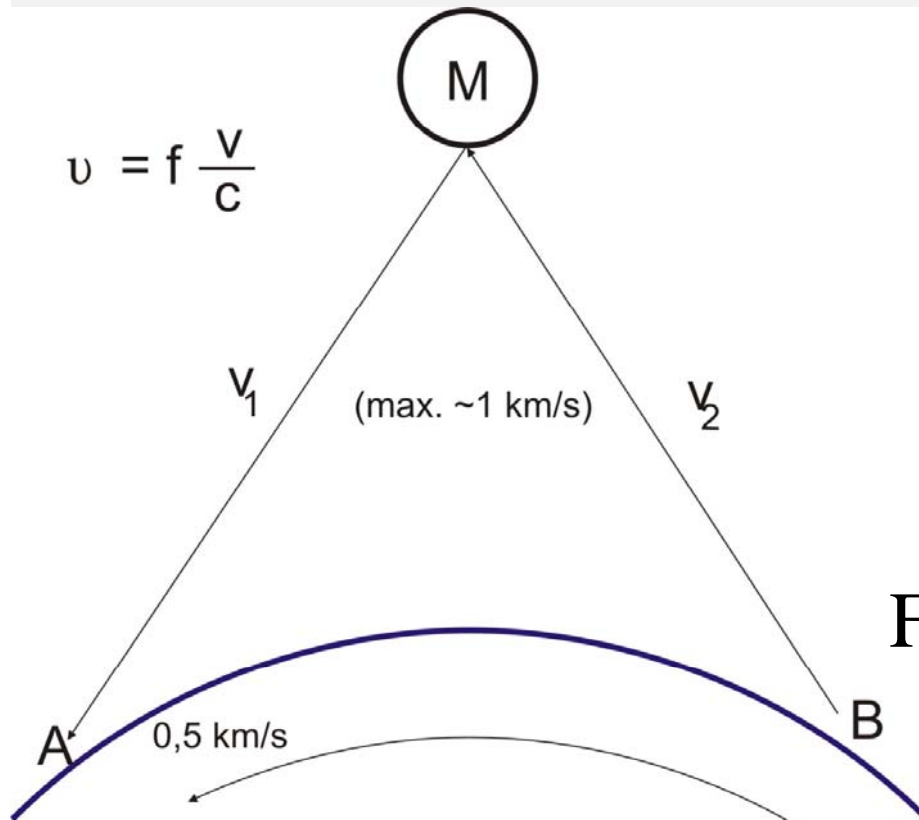
- každopádně transvertor
- pokud možno i IF transceiver (běžná nepřesnost je řádu 100 Hz)
- při slabých signálech je nutná **automatická kompenzace Dopplerova posuvu**

Stejně tak je dobré mít absolutně **přesný čas počítače**, neboť čas **DT** spolu s **DF** a **sync** s kterými pracuje WSJT Pomáhá identifikovat zda přijatá zpráva, byť nedekódovaná, je vhodná pro průměrování (averaging).

Dopplerův posuv frekvence

$$\mathcal{G}_1 = f \frac{v_1}{c}$$

$$\mathcal{G}_2 = f \frac{v_2}{c}$$



$$\text{Echo A} \Rightarrow 2\mathcal{G}_1 \quad \text{Echo B} \Rightarrow 2\mathcal{G}_2$$

$$\text{Mutual} \Rightarrow \mathcal{G} = \mathcal{G}_1 + \mathcal{G}_2$$

$$\text{Echo B} \Rightarrow 2 \left(\text{Mutual} - \frac{\text{Echo A}}{2} \right)$$

$$\text{Full Dopp A} \Rightarrow F_{TX} - \mathcal{G}; F_{RX} + \mathcal{G}$$

$$\text{B} \Rightarrow F_{TX} = F_{RX}$$

$$\text{Const Freq on the Moon A} \Rightarrow F_{TX} - \mathcal{G}_1 \text{ and } F_{RX} + \mathcal{G}_1$$

$$\text{B} \Rightarrow F_{TX} - \mathcal{G}_2 \text{ and } F_{RX} + \mathcal{G}_2$$

EME Doppler - Microsoft Excel

EME Doppler		
Mutual	Self Echo	Dx Echo
2383	-15134	19900
Offset	Frequency	
150	10368.15	
My (DX) Rx	My Rx	Dx Rx
10368.15238	10368.13487	10368.16990
My Tx	My Tx	
10368.14762	10368.16752	

Astronomical data

	AZ	E1
Moon :	265.88	-18.37
Moon/DX :	130.67	-16.79
Sun :	202.58	46.86
Source :	223.54	31.44
	DX	Self
Dop :	2414	-15123
df/dt :	36.22	12.26
Spread :	123.7	75.3
w50 :	45.9	28.0
	RA	DEC
Moon :	19:47	-16.55
Source :	00:00	0.00
Freq:10368	Tsky:	3
MNR: 0.3	Dgrd:	-1.0
DPol: 7	SD:	16.05
LST (h):	2.400	

File to serial

File Settings Help

Transceiver type: Yaesu FT-847

Opened file: C:/Users/Mirek/MyPrograms/WSJT/WSJT10experimental/azel.d

Serial port A - Rotator

Port: COM8

Status: connected

Serial port B - Transceiver

Port: COM7

Status: connected

System parameters

Elevation offset: -0.8

Transceiver freq: 148.15238 MHz

Azimuth offset: -2.6

Track frequency:

PTT:

R 148.15238 MHz

148.16751 MHz

azel.dat

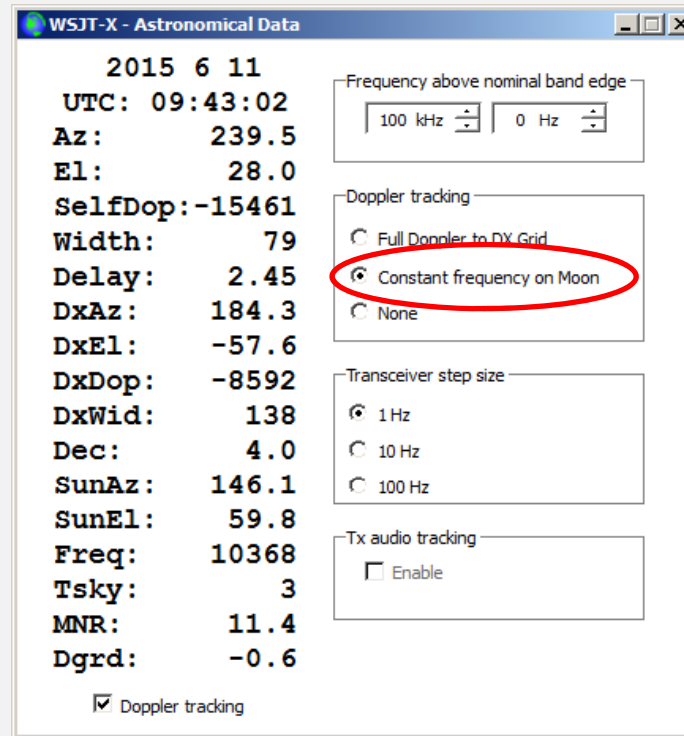
To radio: OK1CA

Grid: JO70gm

Lookup

Add

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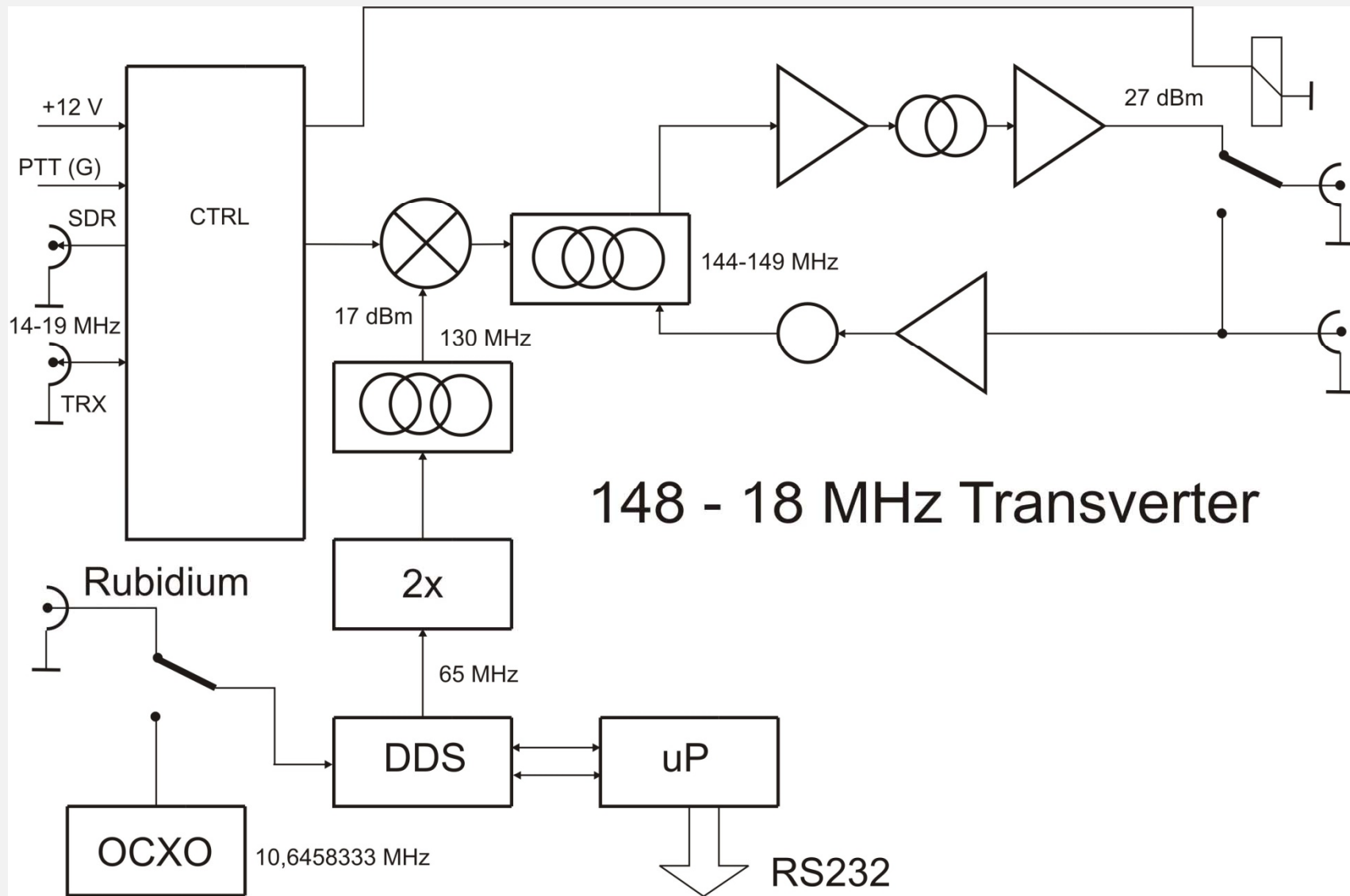


$$\text{Full Dopp} \Rightarrow F_{TXA} = F_{SKED} - \mathcal{D} \quad \text{and} \quad F_{RXA} = F_{SKED} + \mathcal{D}$$

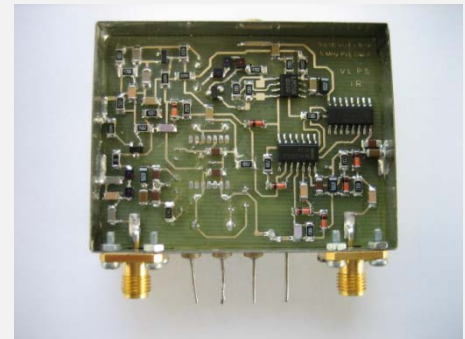
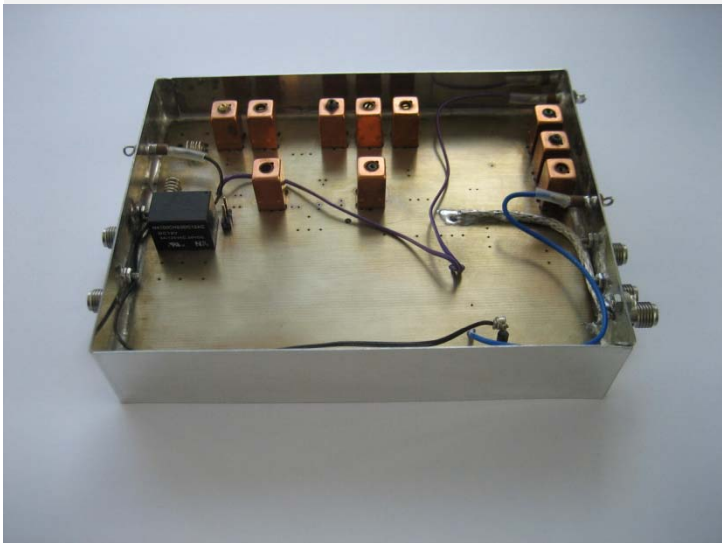
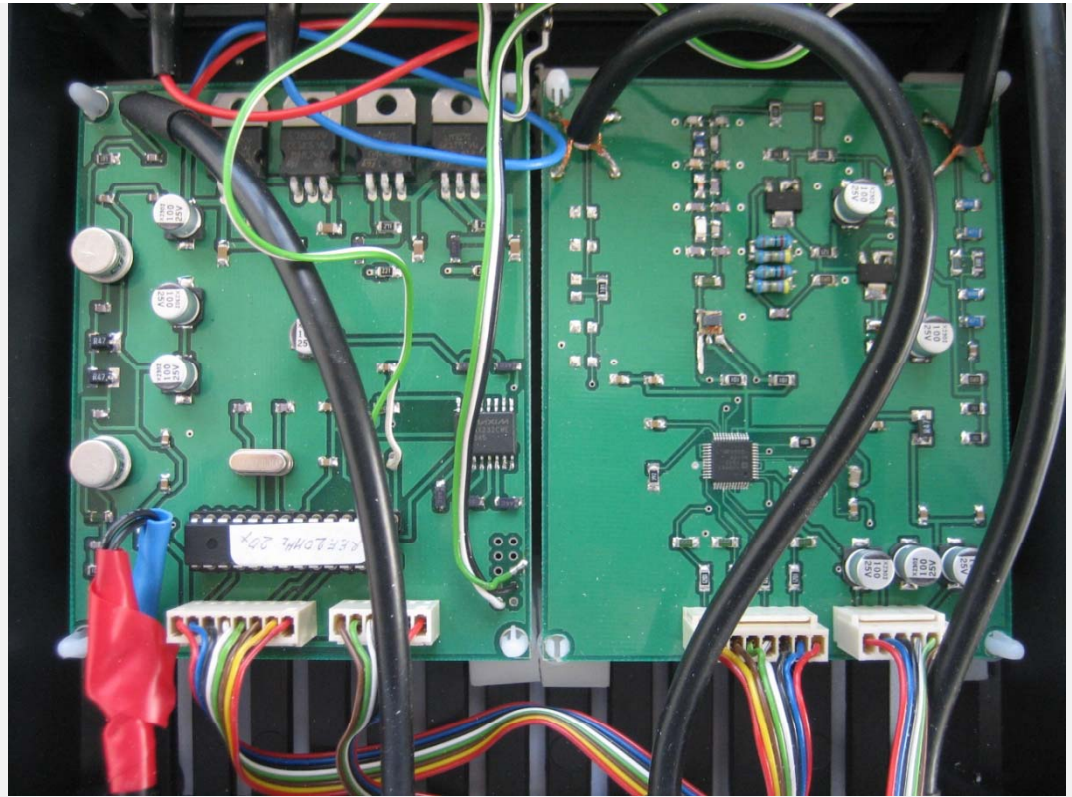
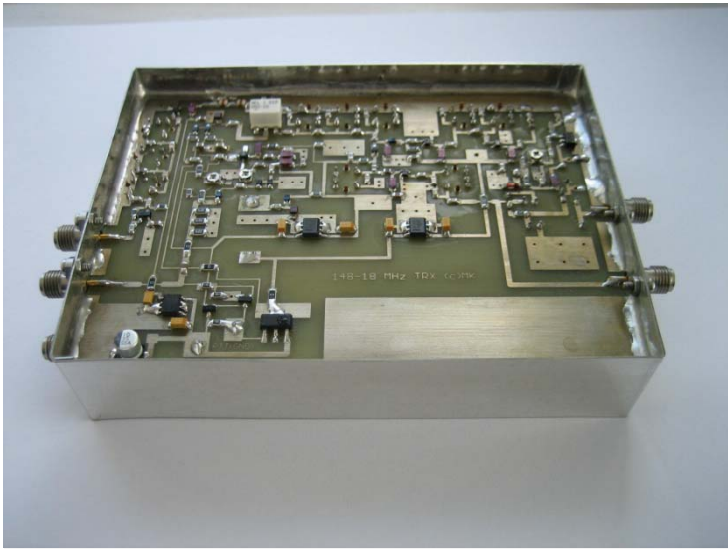
$$F_{TXB} = F_{RXB} = F_{SKED}$$

$$\text{CFq on Moon} \Rightarrow F_{TXA} = F_{SKED} - \mathcal{D}_1 \quad \text{and} \quad F_{RXA} = F_{SKED} + \mathcal{D}_1$$

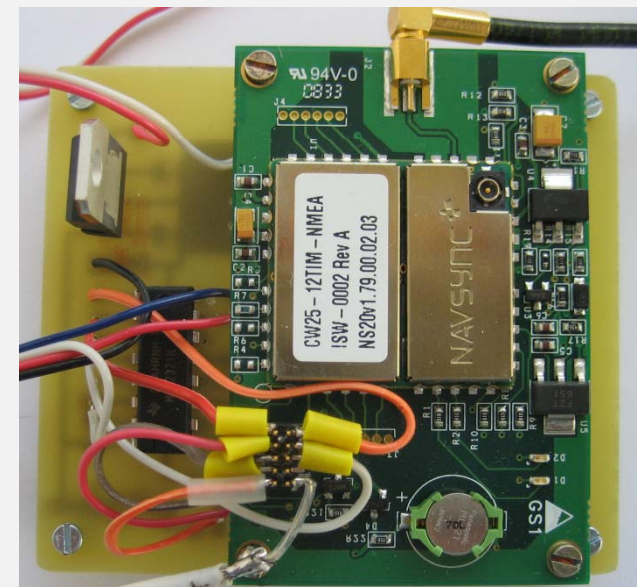
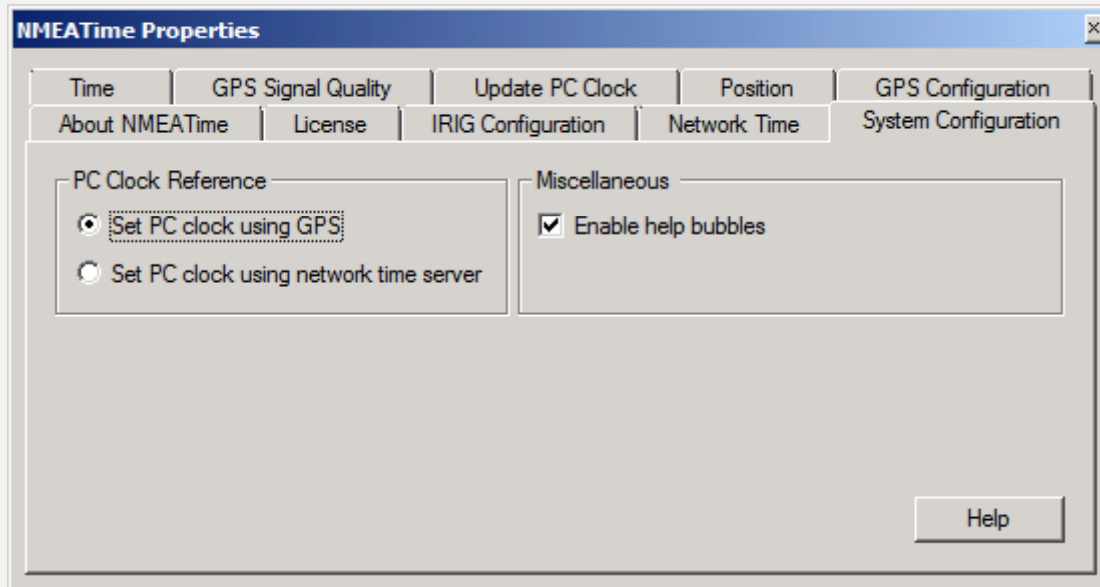
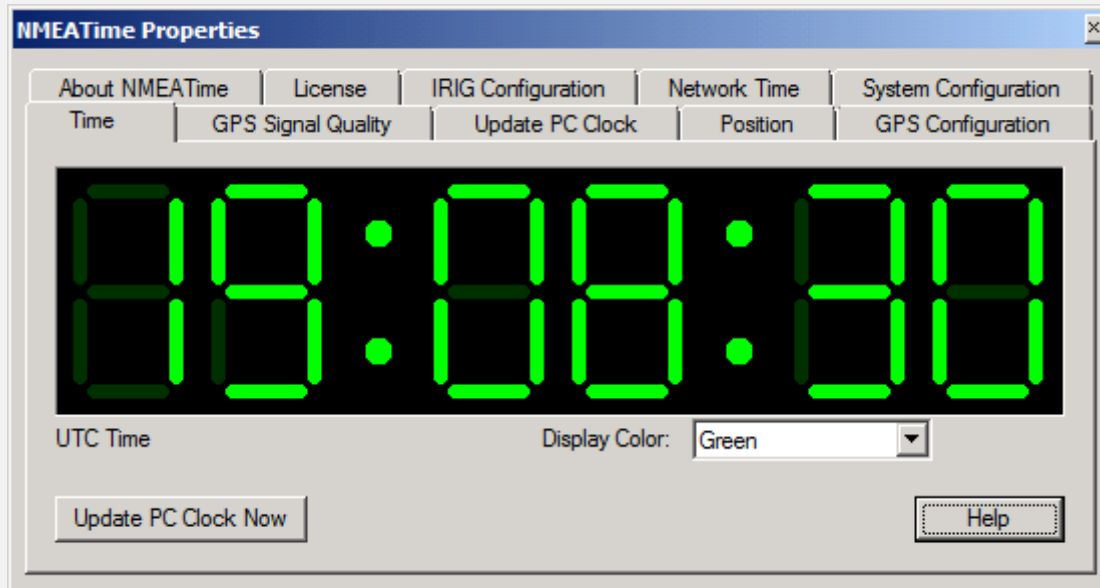
$$F_{TXB} = F_{SKED} - \mathcal{D}_2 \quad \text{and} \quad F_{RXB} = F_{SKED} + \mathcal{D}_2$$



148 - 18 MHz Transverter



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Plánování QSO

Podmínky pro qso se mohou značně lišit:

- **degradace** daná vzdáleností Měsíce
- **spreading** způsobený librací Měsíce

$$\text{SprLoss [dB]} = \frac{\log Spr}{\log 2} = 3,32 \log Spr [Hz]$$

- meteorologické podmínky

Parameter	19 September	3 October
Spreading (Hz)	150	15
Spreading Loss (dB)	7.2	3.9
Degradation (dB)	2.2	0.5
Total Extra Losses	9.4	4.4

VK3UM EME Performance Calculator Ver 9:12

Two Station EME | Rx Performance | Source Pos. | Planets | Sky Map | Home Data | x 10 Multiplier | Note Pad | Feed Type X ref | Version History | VK3UM.com | Help | About | Exit

Tx A (Home Station) OK2AQ_3cm

10.368 GHz | 287.92 dB | 9 K | 2500 Hz | Solid Dish | -143.4 dBm | -15.41 dB

Frequency: 10.368 GHz | Path Loss: 287.92 dB | Rx BW: 9 K | Effective ground 265 K

129 | 0.10 dB | 1.00 dB | 40.0 dB | 1.0 dB | 1.6 dB | 39 K | 0 K | 12.03 dB

10.7cm | LNA Loss: 0.10 dB | LNA Nf: 1.00 dB | LNA Gain: 40.0 dB | Coax Loss: 1.0 dB | Rx Nf: 1.6 dB | Spillover: 39 K | Feedthrough: 0 K | Sun Y: 12.03 dB

Tx A Output Power: 20 Watts | Transmission Loss: 13.01 dBW | Power at Feed: 16 Watts | 12.01 dBW | 395,505 W EIRP

RxTK 83.6 K = 1.10 dB | Tsys 131.6 K = 1.63 dB

Dx Station as received at Home Station ... -18.81 dB

Home Station as received at Dx Station ... -21.26 dB

Change Moon Distance | Perigee: 356,000 kms | Apogee: 405,000 kms

Tx B (Dx Station) VK7MQ_3cm_1

10.368 GHz | 287.92 dB | 9 K | 2500 Hz | Solid Dish | -144.3 dBm | -24.66 dB

Frequency: 10.368 GHz | Path Loss: 287.92 dB | Rx BW: 9 K | Effective ground 265 K

129 | 0.10 dB | 0.70 dB | 26.0 dB | 1.0 dB | 1.6 dB | 39 K | 0 K | 6.61 dB

10.7cm | LNA Loss: 0.10 dB | LNA Nf: 0.70 dB | LNA Gain: 26.0 dB | Coax Loss: 1.0 dB | Rx Nf: 1.6 dB | Spillover: 39 K | Feedthrough: 0 K | Sun Y: 6.61 dB

Tx B Output Power: 50 Watts | Transmission Loss: 16.99 dBW | Power at Feed: 40 Watts | 15.99 dBW | 180,937 W EIRP

RxTK 59.3 K = 0.81 dB | Tsys 107.3 K = 1.37 dB

Operating Frequency

50 MHz | 144 MHz | 222 MHz | 432 MHz | 900 MHz | 1296 MHz | 2304 MHz | 3456 MHz | 5760 MHz | 10.368 GHz | 24.048 GHz | 47.088 GHz | 70 MHz | 406 MHz | 2295 MHz

Yagi Array 10368 MHz

Single Yagi Gain in dBd: 16.80 dBd | Number of Yagis: 1 | G/T: N/A | Stacking Distance: 18.54°

Array Type and Gain: User Defined

Parabolic Reflector

Focal length 0.72 m | Diameter Size: 1.80 m | f/D: 0.40 | Efficiency: 65% | Beam Width: 1.12° | Gain: 24898 | Dish Gain: 41.81 dBd | 43.96 dBi

62.3 Lambda

Home Station ... Y Factor Calc

Noise Source (Hot): Sagittarius A, Cassiopeia A, Cygnus A, Centaurus A, Taurus A, Virgo A, Termination, Ground

Noise [hot] Flux: 23 Jy | Quiet [cold] Sky: 9 K | System TK: 131.6 K

Point Source Y Factor: 0.00 dB

YU1AW Aperture Source calculations. These are only valid for 144 and 432 MHz. Point Sources should be used for 1296 MHz and above.

Yagi Array 10368 MHz

Single Yagi Gain in dBd: 16.80 dBd | Number of Yagis: 1 | G/T: N/A | Stacking Distance: 18.54°

Array Type and Gain: User Defined

Parabolic Reflector

Focal length 0.31 m | Diameter Size: 0.77 m | f/D: 0.40 | Efficiency: 65% | Beam Width: 2.63° | Gain: 4556 | Dish Gain: 34.44 dBd | 36.59 dBi

26.6 Lambda

Effective Aperture

TxA: 1.66 M | TxB: 0.30 M | Beam Width Ratio: 0.4972 | 0.2127

Moon Beam Fill Factor: 1.0981 | Sun Beam Fill Factor: 1.0813 | G/T Ratio: 189.17 | 42.47

Moon Radar Equ.: 52.25 dB | Current Moon Distance: 404,260 kms | Moon Angular Diam: 0.559°.33'32.8" | Actual Moon Temp: 210 K...51.9 K

Moon return Loss: 287.92 dB | Moon Flux 10°-22: Sv = 5.1844 | Moon Declination: Dec. 7.37° | Corrected sfu: 355

Engineering Panel | 10368 MHz | VK3UM Ver 9:12

Gajów, June 11- 14, 2015

Single or Two Station EME Planner

Home QTH

OK2AQ

Strakov JN89eu 420m ASL

49 : 52 : 11 : N 16 : 22 : 01 : E

Home Station Limits

Min Home Elevation

Min Dx Elevation

Min Spatial

Dx QTH

W5 - TX

Texas EM10ch 0m ASL

30 : 18 : 00 : N 97 : 47 : 00 : W

Select a Dx Station Clear Dx Station

10368 MHz

U.T.C . Date

Start Date End Date

Click on arrow for calendar display

Calculation Interval

Minutes

Calculate

Calculate Moon only when above the Horizon

Save Home Data

UTC	Local	HmAz	HmEI	Dec	GHA	HM-HM	Dx@HM	Lib-HM	DxLocal	DxAz	DxEI	HM-DX	Lib-DX	Spatial	dB	TK
Saturday 16/5/2015																
1045	+1245	210.62	46.24	9.70	4.34	-8158	8453	97	0445	79.33	1.28	25064	91	79	-0.50	12
1100	+1300	215.45	44.99	9.74	7.95	-9322	7899	95	0500	81.09	4.37	25119	77	82	-0.48	12
1115	+1315	220.07	43.58	9.78	11.57	-10452	7309	92	0515	82.82	7.49	25069	62	86	-0.47	12
1130	+1330	224.49	42.03	9.81	15.18	-11544	6685	88	0530	84.55	10.61	24915	48	88	-0.45	12
1145	+1345	228.72	40.36	9.85	18.79	-12593	6032	85	0545	86.28	13.75	24656	34	-89	-0.43	12
1200	+1400	232.75	38.57	9.88	22.40	-13595	5349	81	0600	88.02	16.90	24294	19	-87	-0.42	12
1215	+1415	236.61	36.68	9.92	26.01	-14546	4642	78	0615	89.79	20.06	23829	5	-85	-0.40	12
1230	+1430	240.30	34.71	9.95	29.63	-15442	3911	75	0630	91.59	23.21	23264	9	-84	-0.39	12
1245	+1445	243.84	32.66	9.99	33.24	-16280	3160	72	0645	93.44	26.37	22599	22	-83	-0.38	12
1300	+1500	247.25	30.56	10.02	36.85	-17056	2391	69	0700	95.35	29.52	21838	36	-82	-0.36	12
1315	+1515	250.53	28.40	10.06	40.46	-17768	1608	68	0715	97.35	32.67	20984	48	-81	-0.35	12
1330	+1530	253.70	26.20	10.09	44.08	-18413	813	68	0730	99.45	35.81	20039	60	-81	-0.34	12
1345	+1545	256.78	23.96	10.12	47.69	-18988	10	69	0745	101.68	38.93	19008	72	-81	-0.32	12
1400	+1600	259.78	21.69	10.15	51.30	-19491	-799	71	0800	104.07	42.02	17893	83	-81	-0.31	12
1415	+1615	262.70	19.41	10.19	54.91	-19921	-1610	74	0815	106.65	45.08	16701	94	-82	-0.30	12
1430	+1630	265.58	17.11	10.22	58.53	-20275	-2420	79	0830	109.48	48.11	15434	104	-83	-0.29	12
1445	+1645	268.40	14.80	10.25	62.14	-20553	-3227	84	0845	112.60	51.08	14099	113	-85	-0.28	12
1500	+1700	271.19	12.49	10.28	65.75	-20754	-4027	90	0900	116.08	53.99	12701	122	-87	-0.27	12
1515	+1715	273.96	10.19	10.31	69.36	-20877	-4816	97	0915	120.02	56.80	11245	129	-89	-0.27	12
1530	+1730	276.71	7.89	10.34	72.97	-20923	-5593	105	0930	124.53	59.51	9738	136	87	-0.26	12
1545	+1745	279.45	5.61	10.38	76.59	-20890	-6353	113	0945	129.73	62.06	8184	143	83	-0.25	12
1600	+1800	282.19	3.35	10.41	80.20	-20779	-7094	121	1000	135.78	64.42	6592	148	78	-0.25	12
1615	+1815	284.95	1.12	10.44	83.81	-20592	-7812	130	1015	142.84	66.52	4967	152	72	-0.25	12
Sunday 17/5/2015																
1130	+1330	208.90	50.43	13.29	1.87	-8305	7647	109	0530	75.06	1.00	23598	90	78	-0.61	14
1145	+1345	214.08	49.22	13.32	5.48	-9472	7125	106	0545	76.81	4.04	23722	77	82	-0.60	14
1200	+1400	219.03	47.85	13.35	9.09	-10610	6567	104	0600	78.52	7.11	23743	63	85	-0.58	14
1215	+1415	223.73	46.32	13.37	12.70	-11713	5974	101	0615	80.22	10.19	23661	49	89	-0.57	14
1230	+1430	228.20	44.65	13.40	16.31	-12776	5350	98	0630	81.91	13.30	23476	36	-89	-0.55	14
1245	+1445	232.44	42.87	13.43	19.92	-13796	4697	94	0645	83.59	16.42	23189	24	-86	-0.54	14
1300	+1500	236.47	40.98	13.45	23.53	-14768	4016	91	0700	85.28	19.55	22800	17	-84	-0.52	14
1315	+1515	240.31	39.00	13.48	27.14	-15688	3311	87	0715	86.99	22.70	22310	20	-82	-0.51	14
1330	+1530	243.96	36.95	13.50	30.75	-16554	2584	84	0730	88.72	25.85	21721	29	-80	-0.50	14
1345	+1545	247.46	34.83	13.52	34.36	-17361	1838	81	0745	90.50	29.00	21036	41	-79	-0.48	14
1400	+1600	250.82	32.66	13.55	37.97	-18107	1075	78	0800	92.34	32.16	20257	53	-78	-0.47	14
1415	+1615	254.04	30.44	13.57	41.58	-18788	300	76	0815	94.25	35.32	19387	65	-78	-0.46	14
1430	+1630	257.16	28.19	13.59	45.19	-19402	-487	75	0830	96.26	38.47	18429	76	-77	-0.45	14
1445	+1645	260.19	25.92	13.61	48.80	-19947	-1280	75	0845	98.39	41.61	17386	88	-77	-0.43	14
1500	+1700	263.13	23.62	13.64	52.41	-20420	-2078	76	0900	100.67	44.73	16264	98	-77	-0.42	14
1515	+1715	266.01	21.31	13.66	56.02	-20821	-2878	78	0915	103.14	47.84	15065	109	-78	-0.41	14
1530	+1730	268.83	19.00	13.68	59.63	-21147	-3675	82	0930	105.86	50.91	13796	118	-79	-0.41	14
1545	+1745	271.61	16.68	13.70	63.24	-21397	-4468	86	0945	108.87	53.94	12461	127	-81	-0.40	14
1600	+1800	274.36	14.37	13.72	66.85	-21572	-5253	91	1000	112.27	56.92	11065	135	-83	-0.39	14
1615	+1815	277.08	12.07	13.74	70.46	-21669	-6027	97	1015	116.17	59.82	9614	143	-85	-0.38	14
1630	+1830	279.79	9.78	13.76	74.07	-21690	-6788	103	1030	120.70	62.62	8114	149	-89	-0.38	14
1645	+1845	282.49	7.51	13.78	77.68	-21634	-7531	110	1045	126.05	65.29	6572	155	87	-0.37	12
1700	+1900	285.20	5.27	13.80	81.29	-21501	-8254	118	1100	132.45	67.77	4992	160	81	-0.37	12
1715	+1915	287.92	3.06	13.82	84.90	-21293	-8955	125	1115	140.17	69.98	3383	164	74	-0.37	12

Gajów, June 11- 14, 2015

VK3UM Libration Calculator Ver 1.14

LibCalc | Planner Calculator | DxData Base | Home Data Set Up | Hint set up | Ephemeris Data

Fri 12 Jun 2015 Reset Date X 10 Help | About | Exit

UTC ... 12 June 2015 ... 0919:35 Local ... 12 June 2015 ... 1019:35

 Start Hour End Hour
 +15 z +19 z

Stn A only
 Stn A and B
 Calculate only above Horizon

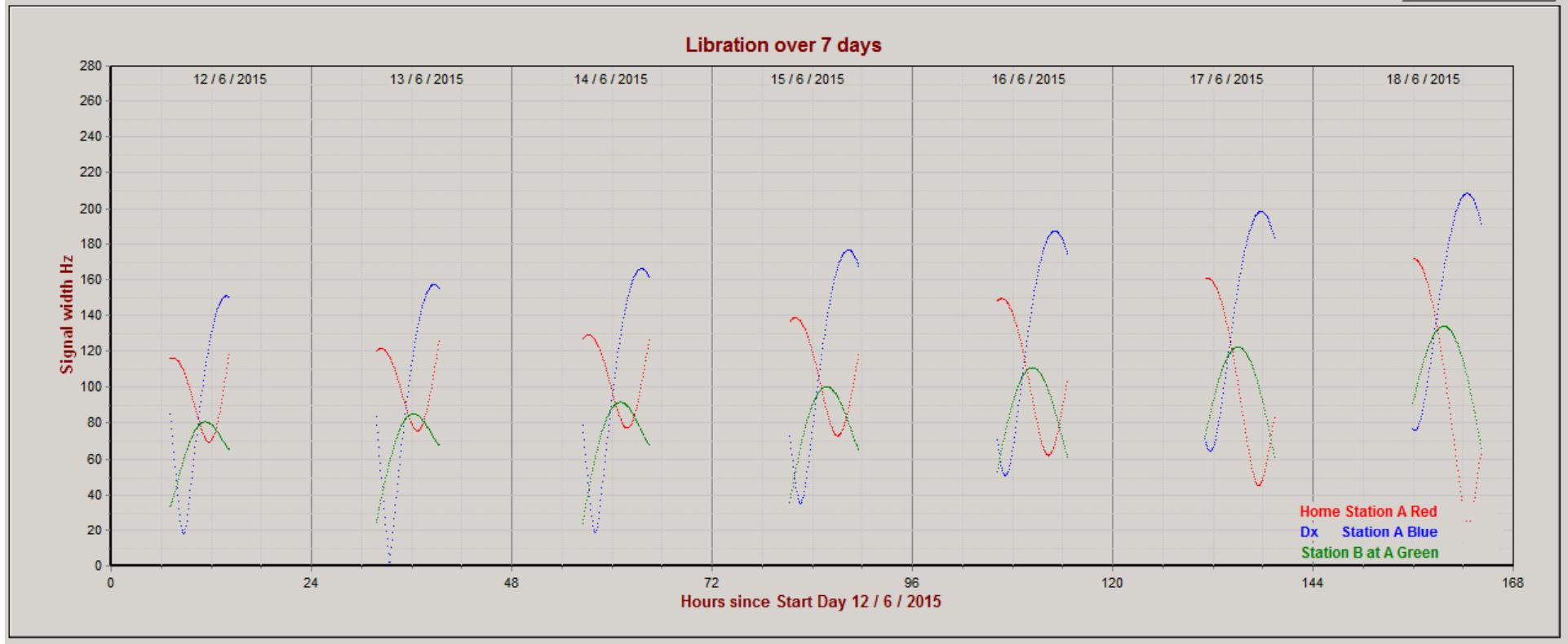
Home Station OK2AQ
 Az 222.72° El 40.86°
 R.A. 01:42:44 Dec 8.83°
 Moon GHA 14.51°
 Current Libration ... 97 Hz
 Diam 0.52° BWR 0.46

(A) Home Station OK2AQ Dish Size
 Longitude 16.3750 1.80 M
 Latitude 49.8569 BW 1.12°

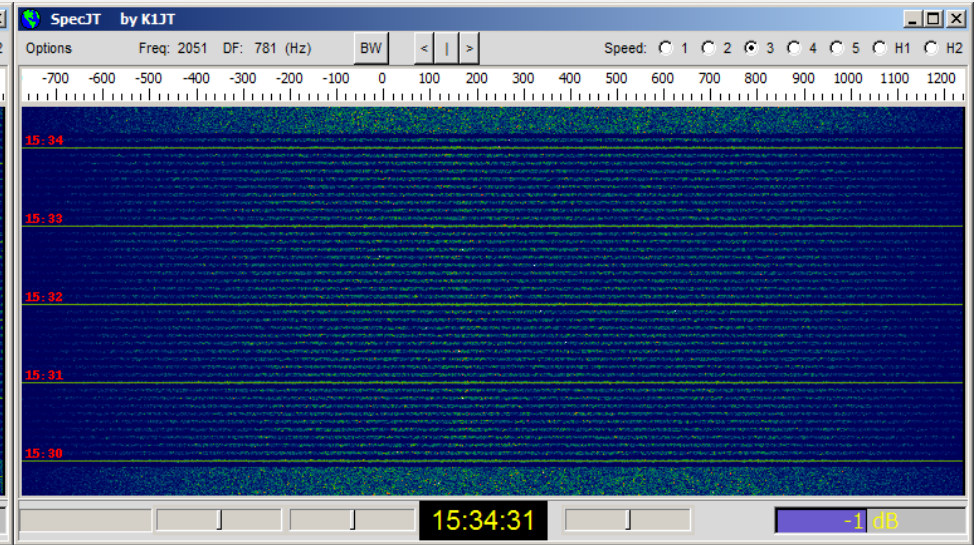
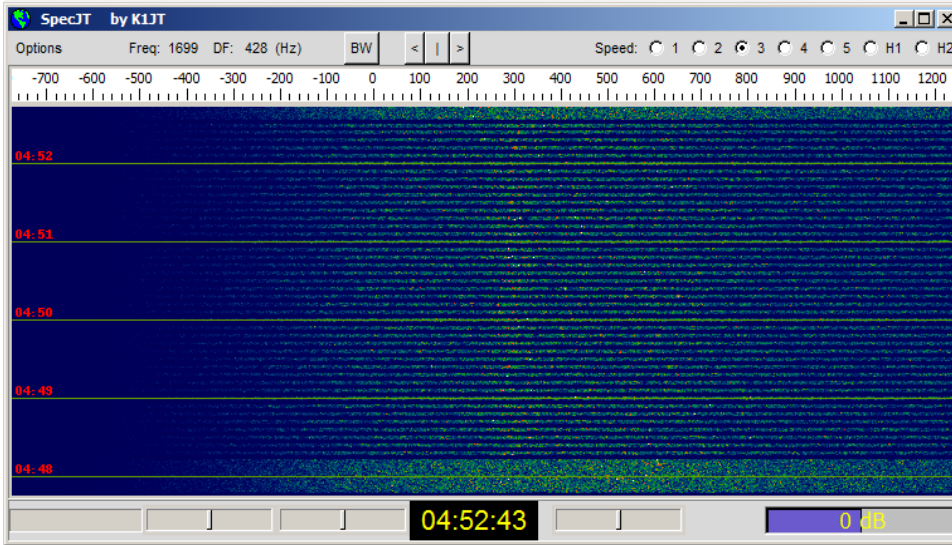
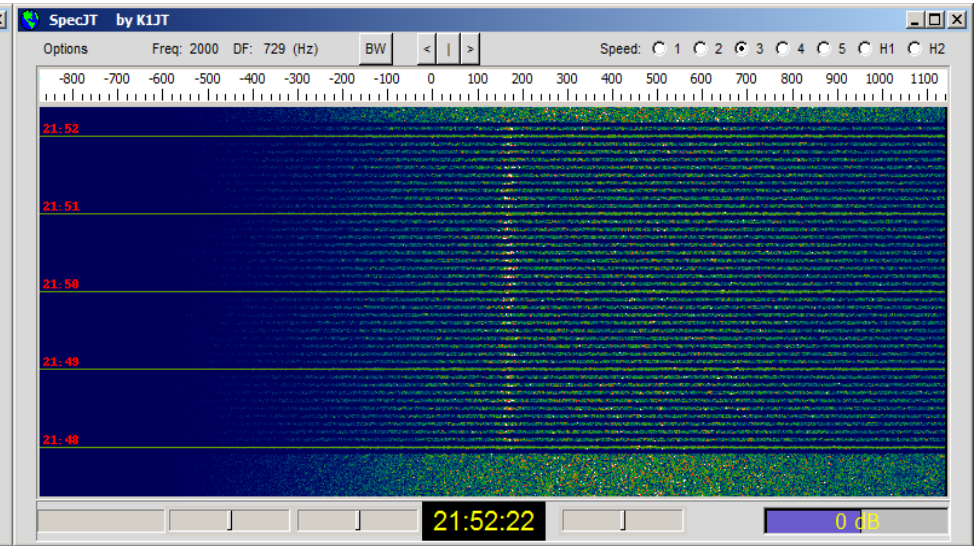
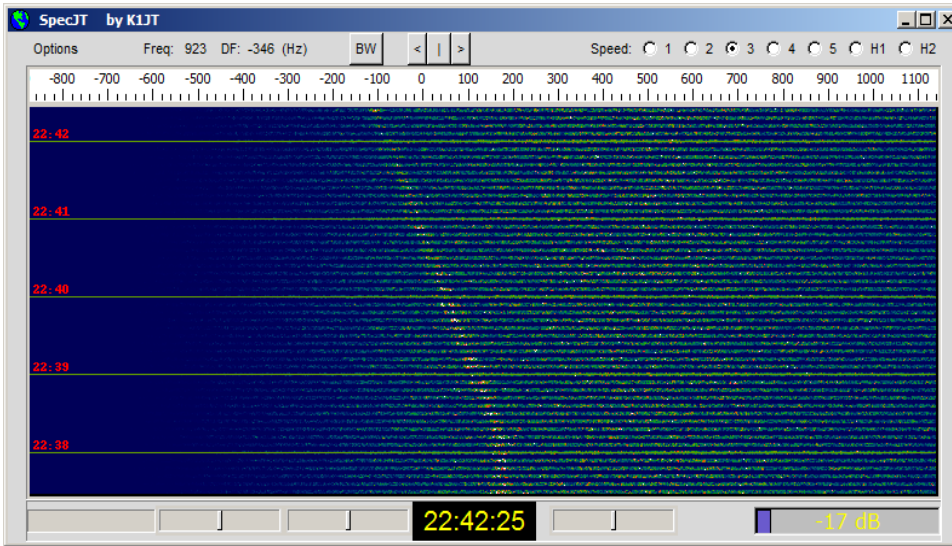
(B) Dx Station K,W,N,AA Dish Size
 Longitude -77.0000 0.77 M
 Latitude 38.9167 BW 2.62°

Libration Frequency
 70 cm 2.3 GHz 5.7 GHz 24 GHz 78 GHz
 1.3 GHz 3.4 GHz 10.4 GHz 47 GHz 122 GHz

Calculation Complete



Gajów, June 11- 14, 2015



Gajów, June 11- 14, 2015

No	Date	UTC	Mode	Callsign	Sent	Rcvd	Locator	# CW	# JT	# MIX	DXCC	QSL	Remarks
28	19.05.2015	10:00	JT4F	OZ1LPR	-12	-20	JO44uw		11				WSJT10
27	18.05.2015	16:16	JT4F	ES5PC	O	O	KO38hj		10	14	12		WS
26	18.05.2015	15:55	CW/JT4F	PA0BAT	O	O	JO31fx		9	13	11		WS
25	17.05.2015	14:24	JT4F	VE4MA	-13	-14	EN19lu		8	12	10		WS
24	17.05.2015	08:58	CW	F1PYR	O	M	JN19da	6		11	9		
23	17.05.2015	07:39	JT4F	UA4HTS	-13	-14	LO43mo						WS
22	17.05.2015	05:36	CW	OK1KIR	O	O	JN79dw						
21	16.5.2015	06:31	CW	OK1CA	O	O	JO70gm	5					
20	15.5.2015	12:20	JT4F	OK1CA	-12	-14	JO70gm						WS
19	15.5.2015	11:46	JT4F	OK1KIR	-12	-14	JN79dw						WS
18	15.5.2015	08:16	CW	OZ1LPR	569	O	JO44uw	4		10	8		
17	14.5.2015	12:22	JT4F	W5LUA	-7	-12	EM13qc						WS
16	14.5.2015	12:06	JT4F	W5LUA	-13	-14	EM13qc		7	9	7		WS
15	13.5.2015	07:16	JT4F	G3WDG	-10	-16	IO92rg						WS
14	4.10.2014	16:15	JT4F	UA4HTS	-14	-12	LO43mo						lib=
13	3.10.2014	17:06	JT4F	G3WDG	-12	-13	IO92rg						lib=
12	3.10.2014	15:29	JT4F	VK7MO	-19	-20	QE37oc	6	8			Y	lib=
11	19.9.2014	12:17	JT4F	OK1CA	-15	-15	JO70gm	5	7				lib=
10	19.9.2014	02:48	JT4F	G3WDG	-12	-16	IO92rg	4	6	6	Y		lib=
9	18.9.2014	09:32	JT4F	UA4HTS	-15	-15	LO43mo	3	5	5			lib=
8	25.7.2014	13:11	JT4F	OK1KIR	-12	-15	JN79dw					Y	lib 151/155; deg=2,18 dB
7	21.7.2014	01:36	JT4F	VK3NX	-14	-14	QF21ct						lib 59/155; deg=1,55 dB
6	20.7.2014	09:01	CW	LX1DB	559	O	JN39co	3		4	4	Y	lib 134/147; deg=1,40 dB
5	20.7.2014	01:30	JT4F	OK1KIR	-13	-13	JN79dw						lib 71/66; deg=1,33 dB
4	20.7.2014	01:18	CW	OK1KIR	569	O	JN79dw	2				Y	lib 65/60; deg=1,33 dB
3	20.7.2014	00:27	JT4F	VK3NX	-14	-14	QF21ct		2	3	3	Y	lib 37/146; deg=1,33 dB; MN= 0,8 dB
2	29.9.2013	11:25	JT4F	OK1KIR	O	O	JN79dw		1	2	2	Y	lib 100/104; deg=2,10 dB
1	28.9.2013	11:13	CW	DL0EF	559	M	JO30im	1		1	1	Y	lib 96/114; deg=2,16 dB



Gajów, June 11- 14, 2015

Reference

- [1] G3WDG: JT4operatingv12.ppt
- [2] http://physics.princeton.edu/pulsar/K1JT/small_station_eme.pdf
- [3] <http://physics.princeton.edu/pulsar/K1JT/doc/wsjt/> (WSJT10 manual)
- [4] <http://www.sucklingfamily.free-online.co.uk/JT4averaging.docx> (“tutorial”)
- [5] VK7MO, OK1KIR, G3WDG: 24 GHz Grid Locator Tour using JT4f. DUBUS, Vol. 44, No. 1, 2015, pp. 99-103
- [6] www.vk3hz.net/microwave/doppler141.zip (VK1XX Doppler control program)
- [7] <http://www.urel.feec.vutbr.cz/esl/files/EME/EME.htm> (OK2AQ pages)